Cambridge O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

3837079367

CHEMISTRY **5070/31**

Paper 3 Practical Test **October/November 2019**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
Qualitative Analysis Notes are printed on page 8.
You should show the essential steps in any calculations and record experimental results in the spaces provided on the Question Paper.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
Total	

This document consists of **8** printed pages.

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1 The reaction between sulfuric acid and potassium hydroxide is exothermic.

$$2KOH + H_2SO_4 \rightarrow K_2SO_4 + 2H_2O$$

When dilute sulfuric acid is added to aqueous potassium hydroxide, the temperature of the mixture increases.

P is aqueous potassium hydroxide.
Q is 1.12 mol / dm^3 sulfuric acid.

(a) Experiment 1

- Pipette 25.0 cm^3 of **P** into a plastic cup supported in a beaker. Measure the temperature of **P** to the nearest 0.5 °C and record the value in column E of the table.
- Put **Q** into a burette. Measure 5.0 cm^3 of **Q** from the burette into a 25 cm^3 measuring cylinder. To the **Q** in the measuring cylinder, add water until the total volume of liquid in the cylinder is 25 cm^3.
- Pour this mixture into the plastic cup containing **P**. Stir, using the thermometer, and measure the highest temperature reached. Record the value in column F of the table.
- Empty the plastic cup and rinse it with water.

Experiments 2–7

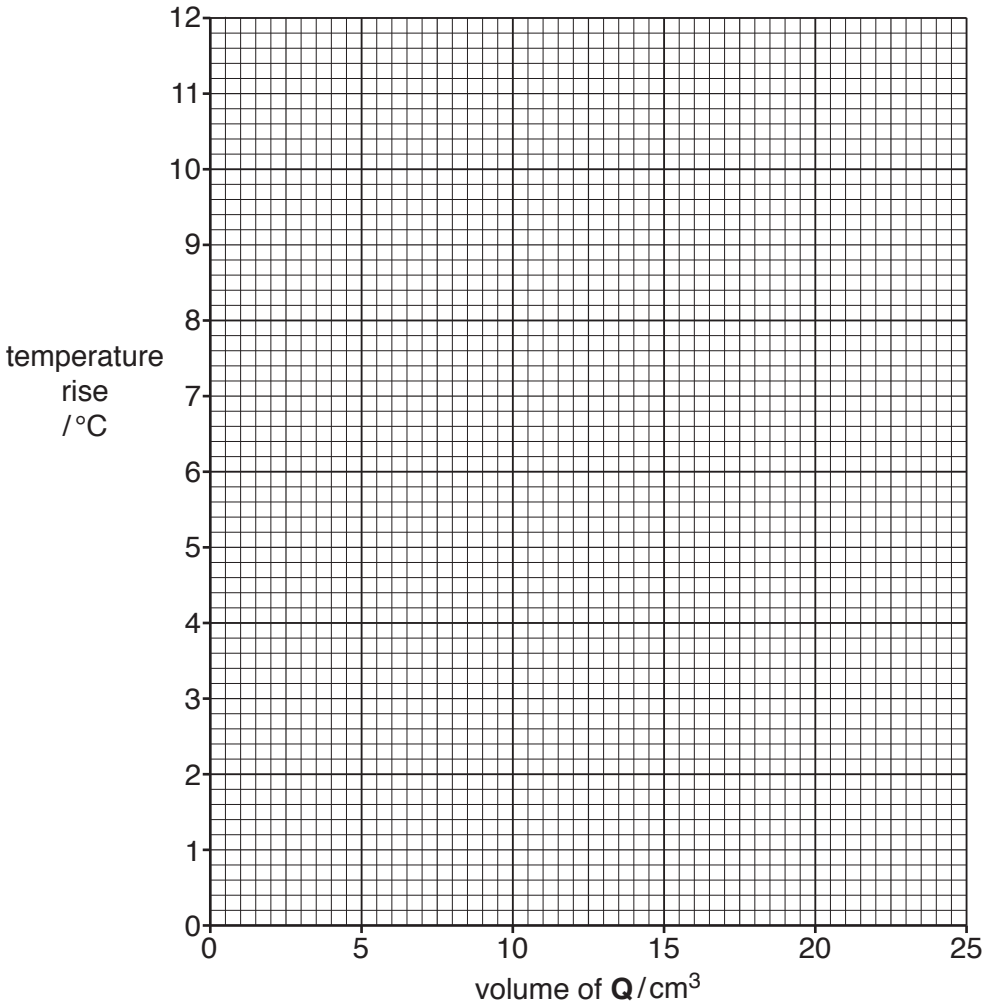
- Repeat **Experiment 1** using the different volumes of **Q** and water given in columns C and D of the table. Refill the burette as necessary.

- Calculate the temperature rise for each of experiments **1–7** and record in column G of the table.

A	B	C	D	E	F	G
experiment number	volume of **P** / cm^3	volume of **Q** / cm^3	volume of water / cm^3	initial temperature of **P** / °C	highest temperature of mixture / °C	temperature rise / °C
1	25.0	5.0	20			
2	25.0	10.0	15			
3	25.0	12.0	13			
4	25.0	16.0	9			
5	25.0	18.0	7			
6	25.0	20.0	5			
7	25.0	25.0	0			

[12]

(b) Plot a graph of temperature rise (column G) against volume of **Q** (column C) on the grid. Use these points to draw two intersecting straight lines.



[3]

(c) From the graph, read the volume of **Q** where the two lines cross.

volume of **Q** ..... cm^3 [1]

(d) Your answer to **(c)** is the volume of **Q** that exactly neutralises 25.0 cm^3 of **P**.

Calculate the concentration, in mol/dm^3, of potassium hydroxide in **P**. Give your answer to 2 significant figures.

$$2KOH + H_2SO_4 \rightarrow K_2SO_4 + 2H_2O$$

concentration of potassium hydroxide in **P** ..... mol/dm^3 [2]

(e) How has heat loss been reduced in the experiments?

.....

..... [1]

(f) Suggest **two** ways in which the accuracy of the temperature rises in the experiments can be improved.

1 .....

.....

2 .....

.....
[2]

[Total: 21]

Please turn over.

2 You are provided with metal **R** and solution **S**.

(a) Carry out the following tests and record your observations in the table. You should test and name any gas evolved.

test no.	test	observations
1	To 2 cm depth of dilute hydrochloric acid in a test-tube, add a piece of **R**. Once the reaction is complete, keep the solution for use in tests **2** and **3**.	
2	To about half of the solution from test **1** in a test-tube, add aqueous sodium hydroxide until no further change occurs.	
3	To the other portion of the solution from test **1** in a test-tube, add aqueous ammonia until no further change occurs.	
4	**(a)** To 1 cm depth of **S** in a test-tube, add aqueous sodium hydroxide until no further change occurs. **(b)** Add the mixture from **(a)** to 1 cm depth of aqueous hydrogen peroxide in a boiling tube.	
5	**(a)** To 1 cm depth of **S** in a test-tube, add an equal volume of aqueous potassium iodide. **(b)** To the mixture from **(a)**, add 1 cm depth of organic liquid. Shake the mixture then leave to stand.	
6	**(a)** To 1 cm depth of **S** in a test-tube, add an equal volume of aqueous silver nitrate. **(b)** To the mixture from **(a)**, add dilute nitric acid.	

[16]

(b) Conclusions

Suggest what type of metal **R** is.

R is ..... .

Identify the cation and anion in **S**.

The cation in **S** is ..... and the anion in **S** is ..... .
[3]

[Total: 19]

QUALITATIVE ANALYSIS NOTES

Tests for anions

anion	*test*	*test result*
carbonate (CO_3^{2-})	add dilute acid	effervescence, carbon dioxide produced
chloride (Cl^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
iodide (I^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	yellow ppt.
nitrate (NO_3^-) [in solution]	add aqueous sodium hydroxide, then add aluminium foil; warm carefully	ammonia produced
sulfate (SO_4^{2-}) [in solution]	acidify with dilute nitric acid, then add aqueous barium nitrate	white ppt., insoluble in excess dilute nitric acid

Tests for aqueous cations

cation	*effect of aqueous sodium hydroxide*	*effect of aqueous ammonia*
aluminium (Al^{3+})	white ppt., soluble in excess, giving a colourless solution	white ppt., insoluble in excess
ammonium (NH_4^+)	ammonia produced on warming	–
calcium (Ca^{2+})	white ppt., insoluble in excess	no ppt.
chromium(III) (Cr^{3+})	green ppt., soluble in excess, giving a green solution	green ppt., insoluble in excess
copper(II) (Cu^{2+})	light blue ppt., insoluble in excess	light blue ppt., soluble in excess, giving a dark blue solution
iron(II) (Fe^{2+})	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) (Fe^{3+})	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
zinc (Zn^{2+})	white ppt., soluble in excess, giving a colourless solution	white ppt., soluble in excess, giving a colourless solution

Tests for gases

gas	*test and test result*
ammonia (NH_3)	turns damp red litmus paper blue
carbon dioxide (CO_2)	turns limewater milky
chlorine (Cl_2)	bleaches damp litmus paper
hydrogen (H_2)	‘pops’ with a lighted splint
oxygen (O_2)	relights a glowing splint